Technology for Alaskan Transportation

Fall/Winter - Volume 16 Number 3/4
Alaska Transportation Technology Transfer Program

IN THIS ISSUE . . .

ALASKA TRANSPORTATION TECHNOLOGY TRANSFER

This newsletter is funded by a grant from the Federal Highway Administration and the Alaska Department of Transportation and Public Facilities.

AUTOMATIC TIRE CHAINS

taken from Wyoming Technology Transfer, Winter 1991

The automatic tire chain, an odd-looking invention developed in Europe some 13 years ago, has begun to catch on in Wyoming. The device can be activated or deactivated by a dashboard switch, without the driver ever leaving the driver's seat.

The automatic tire chain consists of a rubber disk with six twisted chains 13 inches long hanging by one end from its circumference, and is mounted on a shaft controlled by an air cylinder. When activated, the chainwheel is lowered into contact with the drive tires. The rubber disk then spins with the speed of the drive tires, and centrifugal force throws the lengths of chain between the tire and the road surface. When deactivated, the system brings the chain wheel back to the rest position by means of a return spring, and the chains hang freely beneath the vehicle without disturbance.

A recent report on the device concluded that the "automatically activated chains provided a higher degree of safety than manually applied chains because they could be applied instantly when needed", and the breaking performance was "equivalent or superior to manually applied chains".

Among other advantages there is no time lost mounting and removing manually-applied chains, less vehicle damage from broken chains, lower road damage since chains can be retracted when the road surface is dry, and greater chain life.

Several agencies in Wyoming are

(continued on page 2)

INNOVATIONS

Michigan, a northern tier state with snow problems similar to Alaska, has devised some helpful inventions. The Bridge, Michigan's Technology Transfer Center's newsletter, reports some of those innovations. The article reprint follows.

GRAND TRAVERSE INNOVATIONS

Innovative staff at the Grand Traverse County garage have solved problems by inventing new technology. This article features three of their inventions that could prove useful in other Michigan counties and in other states.

Dump Body Airfoil

A common problem with trucks used for clearing snow off highways and roads is the accumulation of snow on the back of the vehicle. This snow obscures motorists' view of the tail lights and any caution signs located at the rear of the truck.

Last winter, as an experiment, the Grand Traverse County garage placed an airfoil on the tailgate of the V-body dump truck used for plowing. The airfoil worked like a charm throughout the winter, keeping lights and caution sign on the back of the truck clearly visible.

When spring arrived, the airfoil was left on the tailgate, and that was

(continued on page 2)

Automatic Tire Chains
(continued from page 1)

now using the device. United Parcel Service in Casper has been using the automatic chains for the past four years on certain runs. Mr. Wadell, a Casper UPS Employee, feels the device is excellent for the Casper area because of its high driver acceptance, fairly low maintenance costs, and feels it has become an asset for winter transportation.

The Jackson School District has a difficult route on which they have used the device for a number of years. Jodi Seaton, the route driver, is so satisfied with the performance of the chains that she will not drive a bus without them. The Jackson School District also indicated a favorable maintenance record.

Uinta County School District has automatic chains on their school buses and they have found them to be very efficient. They are not inexpensive, but "Who hauls a more valuable load?" This, in itself, justifies the expense. The district has an excellent safety record and would not operate without the automatic chains. The Kemmerer School District also uses the device.♦

Innovations
(continued from page 1)

when it became clear that the airfoil had year-round applications. After working gravel roads, the tail lights and caution sign were surprisingly free of dust.

Lee Cram, a Grand Traverse County driver, summed it up: "I've been blading gravel for four days. To look at the back of the truck, you'd never know it. This thing really works."

Grand Traverse plans to have airfoils mounted on more of their trucks this winter.

The airfoil is made from an old aluminum road sign bent into a simple curve. The frame is made from one inch flat stock. It spans the tailgate in two sections, right and left. This eliminates the need to replace the whole span in the event the foil is damaged (which happened to the prototype) by a loader bucket while filling the box.

CYLINDER CAP WRENCH

The mechanics at the Grand Traverse County garage were continually frustrated with the commercial cylinder wrenches used in their shop. The wrenches had only one set screw on the wrench head. When applying heavy torque to stubborn end caps, the set screw would break loose, scoring the edge of the cap.

To solve this problem once and for all, the mechanics designed their own wrench and had it fabricated at the local machine shop. The wrench head is made of 1/2- to 3/4-inch plate steel with four set bolts.

County Shop Foreman Larry King says: "This wrench stands up to the toughest cylinder cap. It doesn't slip, and it breaks 'em loose every time."

CURB SCRAPER ON BUCKET

To speed up spring cleaning along the trunk line, Grand Traverse County added a curb scraper to the bucket of the tractor used in the operation. Mechanic Dan Ferguson points to the edge of the scraper, which drags along the top of the curb, pushing debris towards the roadway and into the bucket. The scraper assembly was made with scrap materials; the scraper edge is a piece of old mower blade.

The loader bucket is also unique. Its width has been shortened so the operator can dump material directly into the back of the dump truck. This feature eliminates the need for the tractor to pull out into the roadway to dump the bucket over the side of the truck. Traffic flow is not interrupted and crew safety is enhanced.

The Bridge, Volume 6, Number 1.♦

News & Views

CDL

Do you know someone who needs to get a CDL but who has trouble reading and studying the manual? "ROAD to Success" may help. R.O.A.D. (Real Opportunity for Advancement and Development) to Success is a do-it-yourself question-and-answer course on a computer. There are also some printed materials that help drivers develop reading skills necessary to study for and pass the CDL exam.

The prices for the computer software are: general knowledge, $504; air brakes, $101; combination vehicles, $101; and the software reference guide, $35. Print materials are also available. Contact the Institute for the Study of Adult Literacy at 814/863-3777. ♦

CDL VIDEOTAPES!

The T2 Program has aquired three copies of CDL Systems, Inc., "No Nonsense CDL," 3-tape instructional video set. It includes information about hazardous materials.

If you would like to borrow this videotape set, please contact Susan at the T2 Office at (907) 474-2484.♦

Your Right to Know

You have a right to know about the chemicals you use on the job. The Federal Occupational Safety and Health Administration's Hazard Communication Standard guarantees this. You have a right to a label on the container that identifies the chemical and displays health hazard warnings. You also have a right to inspect the Material Safety Data Sheets (MSDS) for the chemical you use.

The MSDS tells how to store the chemical and clean up spills. It gives such useful information as the maximum chemical exposure level and what protective equipment you should wear. It even explains how to contact the chemical manufacturers for more information. These MSDS sheets are on file at each maintenance building and district office.

From Missouri Transportation Bulletin, Fall 1990.♦

Send us your comments, suggestions or news.

We love to hear from you.

This Might Catch Your Interest

Are you lost in the maze of what's going on with state budget policies? "ISER Fiscal Policy Papers" is a series of newsletter-type publications published by UAA's Institute of Social and Economic Research and funded by ARCO Alaska. The authors "...intend the papers to focus the attention of state officials and other Alaskans on the fiscal crisis in Alaska's future". They do a good job of presenting their scenarios (meaning, they use lots of pictures for those of us who aren't economists). Number 6, "Who Will Pay For Balancing the Budget?," just came out.

To get on their mailing list and request back issues, write:

ISER Fiscal Policy Papers
Institute of Social
and Economic Research
University of Alaska Anchorage
3211 Providence Drive
Anchorage, Alaska 99508.♦

1991 Alaska Transportation Forum

The 1991 Alaska Transportation Forum was held November 7, 1991 in Anchorage, Alaska.

In addition to acting as a meeting for the general exchange of ideas and information regarding the Alaskan transportation system, a theme is selected by the University of Alaska Transportation Center (UATC) based on a perceived need. This year's theme was "Multimodal Transportation Systems in Alaska," with particular emphasis on resources and economic development. Other topics addressed current issues and on-going research relevant to transportation in Alaska.

The keynote speaker was W. Keith Gerken, Deputy Commissioner of the Alaska Department of Transportation and Public Facilities. Gerken's keynote address was titled, "The Future of Alaska's Transportation System."

Two new additions were included in this year's Forum: geographic information systems and technology transfer. George "Bub" Mueller (Research Analyst, INE) presented "GIS for Transportation Engineering Applications." Mueller also provided a GIS demonstration. The Forum's afternoon concurrent sessions were dedicated to technology transfer. The sessions were aimed at providing current research findings and their application to transportation engineering.

For more information contact Lutfi Raad, Director UATC, Institute of Northern Engineering, University of Alaska Fairbanks, Fairbanks, Alaska 99775.

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COMMERCIAL DRIVER LICENSE CLASSES

If you have drivers who feel they need some extra assistance to prepare for the CDL exam, the Alaska Trucking Association (ATA) can help.

Six-hour CDL preparation study sessions are being formed. Mr. Mark DeLoach will use the latest video tapes combined with lectures and sample tests to help ensure first time passage of the Alaska CDL written exam.

Mr. DeLoach has successfully tutored more than 900 commercial drivers in Alaska.

The cost if $50.00 per student. Payment in advance is required to guarantee space for each student. Each class will be limited in size to assure quality instruction. Call Pat at ATA, 276-1149, for class dates.

Special arrangements for custom group classes of more than 10 students – to be held daytime, evenings, or weekends can also be made. Call Pat to make arrangements – 276-1149.

What happens after April 1, 1992 if you're operating a vehicle which requires a Commercial Driver's License (CDL)?

1. Cited for violation of AS28.15.041(c)
   - Class "B" misdemeanor
   - Mandatory court appearance
   - Up to $500 fine/90 days in jail
   - 2 Points on the driver's record

2. If the operator is not qualified (no CDL), the vehicle may be subject to impound if no qualified operator can respond to the location to drive the unit.

Remember: April 1, 1992 is the date for CDL's and that's not an April Fool's Day Joke!!!

This information is brought to you as a courtesy of the Alaska State Troopers.

Adapted from Alaska Trucking Asocation Newsletter, December 1991. ♦

Farewell, UAF

Our state is large geographically but small in population, and government is a significant employer. Consequently, when major changes happen within government, the ripple-down effect can reach "the little guy". In our case, Alaska Department of Transportation and Public Facilities administrators, responding to budgetary constraints, terminated their Statewide Research Section. Since the T2 program has been a cooperative arrangement between the now-terminated Research Section and the University of Alaska Fairbanks, things had to change.

There is still a T2, but as of July 1st, it's been housed entirely within DOT&PF Planning, with Sharon McLeod-Everette at the helm. UAF no longer manages T2 activities. You can find a new address for Sharon in this issue.♦

Goodbye

Goodbye from Larry Johnson, UAF T2 Program Manager, and Charlotte Barker, Newsletter Editor.

Alaska T2, as it shifts from being a joint venture with the University to being housed solely in DOT&PF, leaves half of its staff behind. Larry and Charlotte want to thank you, the T2 audience, for your suggestions, participation, and support for the program. You've been great to work with, and we hope that you'll continue to support Sharon, Susan and T2.♦

WELCOME

Susan Earp, a familiar person at T2, was hired by the State and continues on as T2 Clerk.

James L. Bennett, P.E., rounds out the staff as T2 Engineer. Jim comes from DOT&PF's Construction Section where he spent 13 years becoming thoroughly seasoned.♦

The Alaska Transportation Technology Transfer (T2) Program is funded by the Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration.

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Technology for Alaskan Transportation is a quarterly newsletter that informs local transportation workers in government and industry of useful training materials and services. If you would like to receive our newsletter, use any of our services, or contribute to the newsletter, contact:

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Alaska T2 and FHWA presented *FHWA Demonstration Project No. 73: Highway Drainage Design Workshop* in Anchorage during early October. Because we had such an overwhelming response to the workshop, this issue of Planning, Design and Field Notes is devoted to publications available in our T2 library that deal with designing appropriate drainage for road projects.

Design Charts For Open - Channel Flow Hydraulic Design Series No. 3

This publication, the third in a series on the hydraulic design of highway drainage structures published by the Federal Highway Administration, makes generally available a group of hydraulic charts which facilitate the computation of uniform flow in open channels. Some of the charts are also useful in the design of storm drains.

The 106 page text is not intended to be a treatise of the design of open channels, although a brief discussion of the principles of flow in open channels in included. It is intended, rather, as a working tool to assist the designer already familiar with the subject.

This publication contains charts which provide direct solution of the Manning equation for uniform flow in open prismatic channels of various cross sections, instruction for using the charts, a table of recommended values of n for use in the Manning equation, tables of permissible velocities in earth and vegetated channels, instructions for constructing charts similar to those presented, and a nomograph for use in the solution of the Manning equation. Charts are included for rectangular, trapezoidal, and triangular channels, grass-lined channels, circular pipe channels (part-full flow), pipe-arch channels, and oval concrete pipe channels.

Much of the material in this publication was developed by the Region 3 Office of the Federal Highway Administration (then Region 2, Bureau of Public Roads), in cooperation with the Division of Hydraulic Research (now Environmental Control Group), Office of Research. The publication was assembled by the Hydraulics Branch, Bridge Division, Office of Engineering, and the Division of Hydraulic Research, Office of Research. The only changes in this reprint of the 1961 publication are a redesigned cover and revised preface.

Hydraulic Design of Energy Dissipators for Culverts and Channels FHWA

This 314 page circular provides design information for analyzing energy dissipation problems at culvert outlets and in open channels. The first five chapters gives general information to support the remaining design chapters. Design Chapters VI-XI cover the general types of dissipators: hydraulic jump, forced hydraulic jump, impact, drop structure, stilling well, and riprap. The design concept presented in Chapter I is illustrated in chapter 12, Design Selection. Here, the different dissipator types are compared using design problems.

Much of the information presented has been taken from literature and adapted, where necessary, to fit highway needs. Recent research results have been incorporated, wherever states' present practice and experience dictate.

Drainage of Highway Pavements

This 151 page edition of Hydraulic Engineering Circular No. 12 incorporates new design charts and procedures developed from laboratory tests of interception capacities and efficiencies of highway pavement drainage inlets. A chart for the solution of the kinematic wave equation for overland flow and a new chart for the solution of Manning's equation for triangular channels are provided. Charts and chart use procedures are provided for seven grate types, slotted drain inlets, curb-opening inlets, and combination inlets on grade and in sump locations. Charts, tables, and example problem solutions are included in the text.

The text discusses the effects of roadway geometry on pavement drainage, the philosophy of design frequency and design spread selection, storm runoff estimating methods, flow in gutters, median inlets, embankment inlets, and bridge deck inlets as well as pavement drainage inlets, factors affecting capacity and efficiency, and comparisons of interception capacity. Five appendices discuss the development of rainfall intensity-duration-frequency curves and equations, mean velocity in a reach of triangular channel with unsteady flow, the development of gutter capacity curves for compound and parabolic roadway sections, and the development of design charts for grates of specific size and bar configuration.

Design of Roadside Channels with Flexible Linings

According to this 124 page publication, flexible linings provide a means of stabilizing roadside channels. Flexible linings are able to conform to changes in channel shape while maintaining the overall lining integrity. Permanent flexible lining such as riprap, gravel, or vegetation reinforced with synthetic mat are suitable for hydraulic conditions similar to those requiring rigid linings. Vegetation or temporary linings are suited to hydraulic conditions where uniform flow exists and shear stresses are moderate. Design procedures are given for rock riprap, wire-enclosed riprap, gravel riprap, woven paper with net, jute net, fiberglass roving, curled wood mat, synthetic mat, and straw with net. Special design procedures are presented for composite channels and channels with steep gradients.

The design procedures are based on the concept of maximum permissible tractive force. Methods to determine hydraulic resistance and permissible shear stress for individual lining are presented. Nomographs are provided 1) for solution of uniform flow conditions in trapezoidal channels and 2) for determination of resistance characteristics for vegetation and permissible shear stress for soils.

Hydraulic Design of Highway Culverts

The 272 page Hydraulic Design Series No. 5 combines culvert design information previously contained in Hydraulic Engineering Circular (HEC) Nos. 5, 10, and 13 with hydrologic, storage routing, and special culvert design information. The result is a comprehensive culvert design publication. Hydrologic analysis methods are described and references cited. The authors present culvert design methods for both conventional culverts and culverts with inlet improvements. Storage routing techniques are included which permit the designer to account for ponding effects upstream of the culvert. Unique culvert applications, erosion and sediment control, debris control, structural aspects, and long span culverts are discussed and references cited. Inlet control, outlet control, and critical depth design charts, many of which are newly developed, are included for a variety of culvert sizes, shapes, and materials. New dimensionless culvert design charts are provided for the design of culverts lacking conventional design nomographs and charts. The appendices of the publication contain: equations and methodology used to construct the design charts, information about hydraulic resistance of culverts, and methods of optimizing culvert design using performance curves and inlet depression. Calculation forms are provided for most of the design methodologies in the manual.

Design of Riprap Revetment

This revised version of Hydraulic Engineering Circular No. 11 (HEC-11) is 169 pages long. It represents major revisions to the earlier (1967) edition of HEC-11. Recent research findings and revised design procedures are incorporated. The manual is expanded into a comprehensive design publication. The revised manual includes discussions on recognizing erosion potential, erosion mechanisms and riprap failure modes, riprap types including rock riprap, rubble riprap, gabions, preformed blocks, grouted rock, and paved linings. Design concepts included are: design discharge, flow types, channel geometry, flow resistance, extent of protection, and toe depth. Detained design guidelines are presented for rock riprap, and design procedures are summarized in charts and examples. Design guidance is also presented for wire-enclosed rock (gabions), precast concrete blocks, and concrete paved linings.

Hydrology

This 342 page manual provides a synthesis of practical hydrologic methods and techniques to assist the highway engineer in the analysis and design of highway drainage structures. The manual begins with a discussion of descriptive hydrology, the surface runoff process and hydrologic data with emphasis given to the highway stream-crossing problems. The commonly used frequency distributions for estimating peak flows for basins with adequate data are discussed in detail and illustrated by examples. USGS regional regression equations and other methods for peak flow determinations in ungauged watersheds and in basins with insufficient data are presented with examples. Methods for developing unit hydrographs from stream flow data and by the Snyder and SCS synthesis procedures for ungauged sites are described in detail. Techniques for developing design storms and design hydrographs are given for basins with and without data. The Muskingum method for routing of hydrographs in channels and the storage, indication methods, or storage routing at highway embankments are discussed with illustrative examples. Estimates of peak flow and hydrograph development in urban water-sheds using the SCS methods of TR-55 and the USGS basin development factor procedures are illustrated in detail. The manual concludes with a brief discussion of risk analysis and its dependence on hydrologic analysis.

For More Information

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The last issue of SD&FD provided a form for you to fill out. If you have not already done so, this is a good time to take a few minutes and fill in the form.

In this issue, we will discuss the selection of a Central Processing Unit, CPU. As we discussed last time, the CPU is the brains of the computer. It controls what the machine does and when it does it. The selection of the right CPU will provide the platform for efficient use of your software. You may have noticed that I have asked you to select the type of software that you use before looking at the machine you want to use it on. I maintain that software should be selected first. There have been a number of good computers on the market that have failed to sell because they did not support the right software. Once the software is selected, the machine requirements will become obvious.

IBM & COMPATIBLES VS MACINTOSH

The debate concerning IBM compatible machines and the Macintosh machines is still raging. Which one should you choose? I can't claim to be an expert on Macintosh machines. Therefore, I can give you only what I read and hear. Macs are excellent machines for wordprocessing, databases, and graphics. Macs are much easier to learn. They also network well. (Networking is linking machines to allow transfer of information between them.)

IBM compatibles support ten times the software. Third party peripherals abound for the IBM compatible machines. The cost of IBM compatible machines is considerably less. These machines tend to be the workhorse for the scientific and engineering environments.

The difference between the two machines is rapidly eroding. The choice is becoming less clear with time. If you feel the Mac may be the right machine for you, go down to your local vendor and try one out. Take some of your own work along. This will give you a sense of how well the machine and software fit into your environment. This is good advice for any machine and software.

The remainder of my comments in this series of articles will be aimed at the IBM compatible machines. Forgive me, I'm an engineer. Macs just don't fill my needs.

SELECTING THE RIGHT CPU

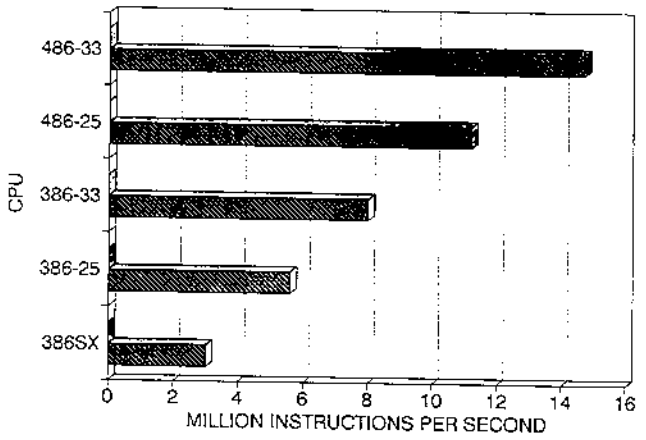
As discussed earlier, selecting the right CPU is the second most important decision in buying a computer. Software selection is the most important. IBM compatible computers use four basic CPUs: the 8086, the 80286, the 80386, and the 80486. (The CPU chip is normally abbreviated with the speed added. For example, an 80386 CPU running at 33 MHz is abbreviated as 386-33.) The 8086 CPU has essentially fallen by the wayside. The 80286 is gasping for its last breath. Software is increasingly requiring the 80386 and 80486 technology. Therefore, I do not recommend the 8086 or 80286 machines to anyone.

The CPU speed now becomes the primary issue. This is where you need to determine what you are going to do with the machine. If you are doing wordprocessing, speed is not an issue since the machine waits for you. On the other end of the spectrum, if you are performing complex mathematical modeling, you can't find a machine fast enough. I hate to wait for a machine.

Figure 1 shows the relative speeds of the more common CPU's. One way to measure the speed of a CPU is how fast it executes an instruction. This is usually measured in Million Instruction Per Second, MIPS. Don't concern yourself with the details. Use the figure to indicate relative speeds. Interestingly enough, the faster the machine, the lower the cost/performance ratio becomes as shown in Figure 2. So, make sure you err on the high side.

Now back to the table you were asked to fill out. Figure 3 shows the minimum machine for each task and its frequency of use. Select the highest CPU for all of your tasks. For example, if you are using Computer Aided Design (CAD)

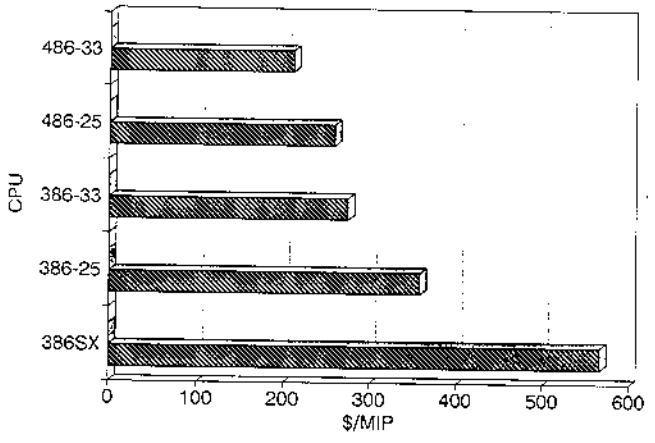
COMPARISON OF CPU SPEEDS



Figure#1

frequently, you would select a 386-33 as your minimum CPU. You may decide to select a 486 machine if you feel you need better performance. That's a decision you and your accountants will have to make. As you make that decision, take into account the cost of the people using the computer. A person costing $40,000/year equates to $.45/minute. That means the 486 machine will need to save at least 33 hours in 3 years to make the upgrade worthwhile. Again, this is a function of how the person uses the computer. It's essentially who is waiting for whom.

PERFORMANCE COSTS



Figure#2

MEMORY

Memory is generally the temporary storage for the CPU. It's where the program is put when you run it. It's where the temporary data is stored as the CPU processes it. Memory is where the device drivers are stored when you turn your machine on. When the machine is turned off, everything in memory disappears. That's kind of like what happens to kids over summer.

Memory is sometimes used to simulate a disk drive. This is sometimes called a virtual disk. Virtual disks provide very fast temporary storage for your programs. If you use a virtual disk, remember to save any data you wish to keep onto your permanent disk drives.

How much memory should you have? The minimum is 4 megabytes. Most new machines come with 4 megabytes of memory as a standard. However, if you use memory intensive programs such as AutoCAD or Windows, you'll need at least 8 megabytes. Right now memory is about $60/megabyte, so the cost for extra memory is relatively insignificant. Don't worry though, if you find you don't have enough memory (for your computer, that is), you can easily add it later.

HARD DISK DRIVES

How big of a hard drive should you buy? I have never known anyone to complain about buying one too big. I have heard many complaints about buying one too small. My best advice is buy as large a hard drive as you can afford.

The form you were asked to fill out should give you some ideas about the minimum drive storage. For example, if you use a wordprocessor, a spreadsheet, and a database, the minimum drive size you will need is 54 megabytes. I usually recommend that no one buy less than a 80 megabyte disk drive primarily because you are going to want room to grow. You will find that disk drives up to 200 megabytes are inexpensive.

When you select your hard drive, you should also look at the access time. If you get one too

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slow, you will be waiting around while the computer gets information off the drive. That can be frustrating at times. Select a drive that has access times under 20 milliseconds. All drive manufacturers publish this information.

FLOPPY DISK DRIVES

Should you get a 5 1/4 or a 3.5 inch floppy drive or both? The ideal is both. However, if you can have only one, choose the 3.5 inch floppy. The industry is rapidly moving that direction. I like 3.5 inch disks because they fit in my pocket. However, there are enough 5-1/4 inch drives around that they are still being supported.

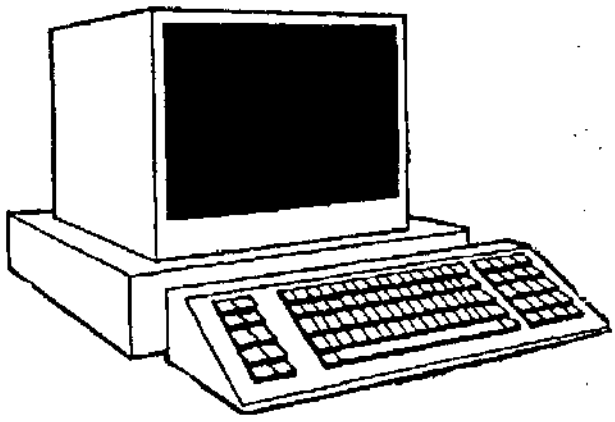
Floppy disks still represent the primary means of moving data from machine to machine. Look around to see where your data might come from. Make sure you have the drives that are compatible with the source of your data.

TAPE BACKUP

You are probably tired of me preaching backup, but you are going to hear it again. Back up your hard drive often. Floppy disks are the most common backup media. However, if you are regularly backing up several megabytes of data, you may want to consider the purchase of a tape backup. Tape backup systems come in many sizes and configurations. They range in cost from about $250 to several thousand. The one that fits your needs must be carefully selected. If you are the only one in the office that needs tape backup, get an internal system. If several machines need regular backup, then consider an external system that can be moved from machine to machine. Most offices find it best to appoint one person to handle backup all the machines in the office on a regular schedule.

NEXT TIME

In the next issue, I will describe how to select the right monitor for you. I will also discuss how to order the machine to your specifications.



COMPUTER SELECTION QUESTIONNAIRE

Check the column that indicates how often during a week you use the software listed. The next issue of *Scrambled Disks and Fried Drives* will provide a key that denotes the size of computer you need, based on the boxes you've checked.

SOFTWARE	AMOUNT OF USE				MINIMUM DISK SPACE (MB)	
	N	S	O	F	SOFTWARE	DATA
Word Processing	-	386SX	386SX	386SX	10	10
Desktop Publishing	-	386SX	386SX	386-25	10	20
Spread Sheets	-	386SX	386SX	386SX	10	10
Database	-	386SX	386SX	386-25	7	5
Computer Aided Design	-	386SX	386-25	386-33	15	40
Accounting (1)	-	386SX	386SX	386-25	15	15
Engineering Software (1)	-	386SX	386SX	386-25	20	20
Windows	-	386SX	386-25	386-25	20	10
DOS	-	386SX	386SX	386SX	2	-
OS/2	-	386SX	386-25	386-33	4	-

KEY: N=NEVER, S=SELDOM, O=OCCASIONALLY, AND F=FREQUENTLY

(1) These softwares vary in requirements. After selecting the software you intend to use, change the disk space requirements according to the vendor's requirements.

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Blowing snow is a maintenance engineer's nightmare. It blinds drivers, causes accidents, and makes clearing the road difficult—at times impossible. When the snow melts, runoff seeps under the pavement where water can cause cracking and heaving.

A well-planned snow fence program can provide a solution to blowing snow problems, and can be an excellent long-term investment. In the 1970s, the Wyoming Department of Transportation reduced snow-and-ice removal costs by more than a third on a 45-mile stretch of Wyoming I-80 where fences were installed. (Table 1)

An average of available state agency data shows that storing snow with snow fence costs 3 cents a ton over the 25-year life of the fence, compared to 3 dollars a ton for moving it.

In addition to their cost-effectiveness, snow fences make roads much safer. The number of accidents caused by poor visibility was reduced by 70 percent in the stretches of I-80 where fences were constructed. A final benefit is that snow stays off the road where runoff cannot damage the pavement or block drainage.

Table 1

Period	Snow Fence Protection (%)	Expenditure for Snow Removal ($)		
		Mile 235–Mile 280.5	Remainder of I-80	Ratio
Jan. 1–Dec. 30, 1970	0	—	—	—
Jan. 1–Dec. 30, 1971	4.54	235 800	489 485	0.482
Jan. 1–Dec. 30, 1972	12.82	104 147	393 177	0.265
Jan. 1–June 30, 1973	16.55	137 055	360 613	0.380
1973–1974 winter	32.34	175 442	604 979	0.290
1974–1975 winter (to Feb 1)	36.71	53 710	219 634	0.245
1975–1976 winter	40.20	—	—	—
1976–1977 winter	40.20	118 729	294 597	0.403
1977–1978 winter	44.04	227 184	623 397	0.364
1978–1979 winter	53.17	297 777	856 804	0.348
1979–1980 winter	53.17	345 580	1 141 134	0.303
1980–1981 winter	53.17	137 240	574 315	0.239

How Snow Fences Work

Blowing snow particles resemble tiny grains of sand. Snow particles that are too heavy to be suspended in the air move by bounding or intermittently jumping (saltating) along the surface. If they are too heavy to saltate, particles roll or creep along the surface, forming "snow waves," or "dunes." Snow fences restrain the wing, reducing wind speed. This reduces the force of the wind on the surface of the snow, allowing the creeping and saltating particles to come to rest. Some of these particles are deposited on the upwind side of the fence because of the reduced wind speed that occurs ahead of the barrier. Most of the snow deposit occurs on the downwind side of the fence.

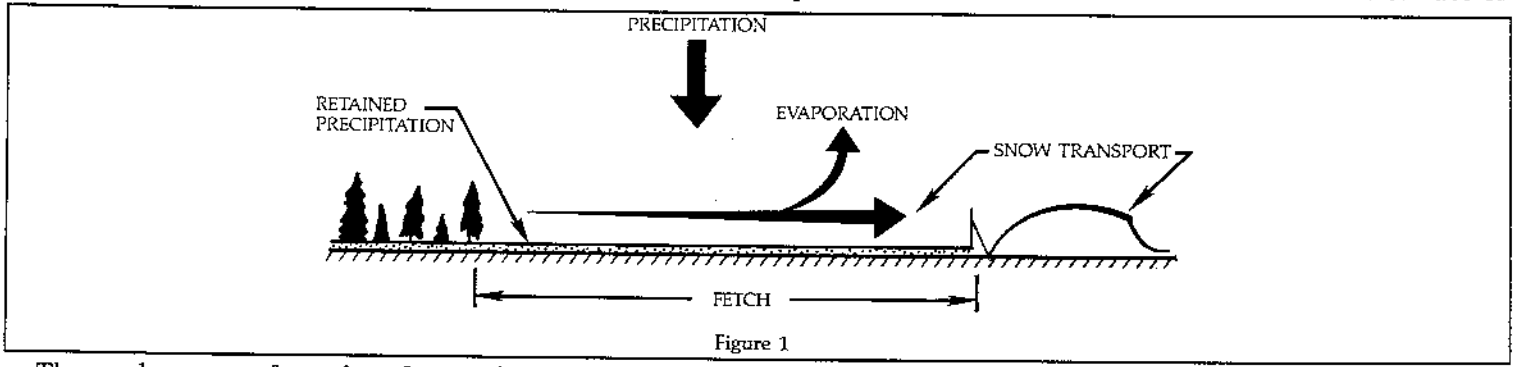


Figure 1

The modern snow fence is a far cry from the 4-foot-high vertical slat fence so common 20 years ago. Placed in contact with the ground, the old-fashioned fence was an ineffective snow collector. Properly designed and placed, taller fences are dramatically more effective than the traditional low picket fence. New lightweight plastics now allow the construction of portable fences up to 8 feet tall.

Fence projects can fail because the fences are improperly designed or placed. One common mistake is failure to design the fence for the capacity of snow it needs to hold over the season. Placing the fence too close to the road can actually make snowdrift problems worse, and is another common mistake.

To encourage more widespread use of this extremely cost-effective technology, Strategic Highway Research Program (SHRP) developed a *Snow Fence Guide* that covers everything maintenance engineers need to know to design and locate snow fences correctly. The *Guide* summarizes the results of new research conducted by Strategic Highway Research Program (SHRP), as well as other research conducted over the last two decades. A 21-minute video, "Effective Snow Fences," supplements the *Guide*.

Designing the Fence

The most important factor in designing a snow fence—and one that often is disregarded—is capacity.

Sizing a snow fence is similar to determining the required capacity for a culvert, detention pond, or storm drain. The first step is to estimate how much blowing snow must be stored, and the second step is to design a fence system that has the capacity to store it.

To estimate the quantity of blowing snow, one must determine the area (fetch) within which the wind can pick up snow and deposit in the road, and the amount of relocated precipitation. Knowing the prevailing wind direction (or directions), fetch distance can be measured on aerial photos or topographic maps, or by direct observation. (Figure 1)

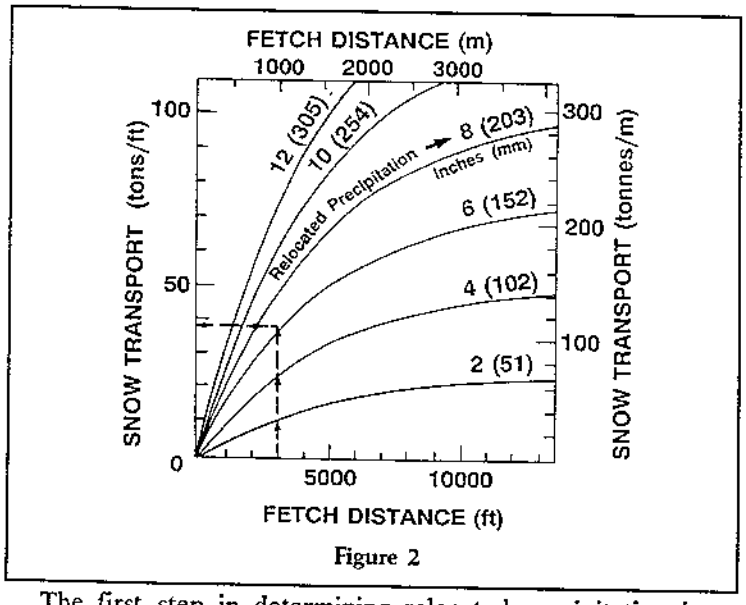


Figure 2

The first step in determining relocated precipitation is to estimate water-equivalent winter precipitation, which is calculated as 10 percent of the annual snowfall. For conservative design, the proportion of precipitation relocated by the wind is usually estimated at 70 percent.

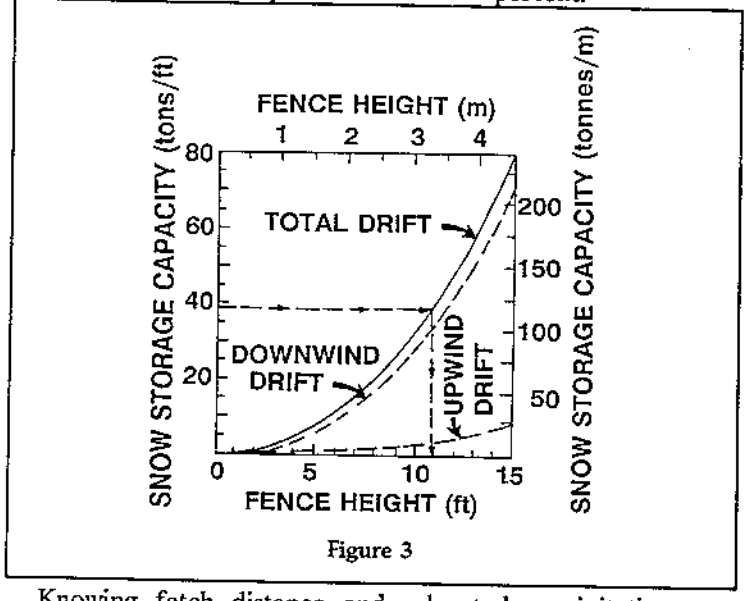


Figure 3

Knowing fetch distance and relocated precipitation, you can use the snow transport curve (Figure 2) to determine the amount of seasonal snow transport. The height of fencing (or number of rows of fence having a specified height) can be determined from the amount of snow transport (Figure 3).

For example, if the fetch upwind of the road is 3,000 feet, and the average annual snowfall is 90 inches, then relocated precipitation would be 6.3 inches (90 inches x 10% x 70%). Enter Figure 2 at a fetch of 3,000 feet, proceed vertically to intercept the relocated precipitation curve at 6.3 inches, and then move to the y axis to determine that snow transport would be approximately 38 tons/foot. In this case, an 11-foot fence would be required, as shown in Figure 3.

Seven rows of 4.5-foot fences would be needed to provide the same snow storage. A single row of taller fence is always preferable to multiple rows of shorter fence. The taller fence not only traps more snow, but also improves driver visibility, costs less, and requires less land. A good rule of thumb is that fences should be at least 8 feet high.

The fence should extend lengthwise far enough to cover the area to be protected, extended on either end by 20 times the height of the fence. The extension allows for variations in wind direction and for the reduced trapping efficiency and storage capacity near fence ends.

Fences should have a gap at the bottom equal to 10-15 percent of the fence height. Leave 40 to 50 percent of the fence surface area open to create "porosity." Solid fences do not collect snow efficiently.

Placing the Fence

Snow fences too close to the road can increase the amount of snow in the road! The distance between fences and the road should be at least 35 time the height of the fence.

Although fences should be perpendicular to the prevailing wind direction, the angle can vary by as much as 25 degrees without affecting performance.

Obtaining Support for Snow Fence Projects

One of the major stumbling blocks for fence projects can be obtaining permission from landowners. The *Guide* offers suggestions on how to negotiate with landowners effectively by recognizing and dealing with their concerns.

For example, one of the concerns commonly expressed by farmers is that snowdrifts will delay tillage or planting operations in the spring. It helps to have information ready on this subject when approaching landowners for snow fence easements. A useful rule of thumb is that snow melts at the rate of 0.22 inch for every 1°F-day above 32°7F.

Using this relationship, climatological information published by the National Weather Service can be used to determine the probable melt-out date, and this information can be helpful in easement negotiation, particularly when it can be shown that the planting delay would be minimal. It is not unusual to find that the drifts formed by the proposed fences are comparable to naturally occurring drifts in the same or nearby fields, providing a persuasive argument in favor of the fences.

For More Information

If you would like to borrow a copy of the *Snow Fence Guide* and accompanying video, please contact the Technology Transfer Office at (907) 474-2484 and ask for Susan.

If you would like to purchase a copy of the *Snow Fence Guide* and accompanying video, contact the Transportation Research Board at (202) 334-3214.

Reprinted from SHRP's Product Alert!, No. 3, August 1991.

FACT SHEET
COMMERCIAL DRIVER'S LICENSE

The Federal Commercial Motor Vehicle Safety Act of 1986 and the Uniform Commercial Driver's License Act of 1989 require commercial motor vehicle drivers to get a Commercial Driver's License (CDL) by April 1, 1992. In addition to private firms, state agencies, boroughs, and cities are affected. Detailed licensing information can be found in the Alaska Commercial Driver License Manual published by the Department of Motor Vehicles. This fact sheet provides an overview of the CDL Program in Alaska.

WHO MUST HAVE A COMMERCIAL DRIVER'S LICENSE

Anyone who drives a commercial motor vehicle that is:

a) a combination of vehicles with a gross weight rating of 26,001 or more pounds;
b) a single vehicle with a gross vehicle weight rating of 26,001 or more pounds;
c) a vehicle designed to transport 16 or more passengers, including the driver;
d) any vehicle that is transporting hazardous materials and is required to be placarded in accordance with Department of Transportation regulations.

ARE THERE ANY EXEMPTIONS FROM THE CDL PROGRAM?

Yes. Persons operating the following vehicles are not required to obtain a CDL in order to drive:

a) Military vehicles: when operated by military personnel for military purposes (does not include a civilian driving a military vehicle).
b) Emergency vehicles or equipment which is necessary to the preservation of life or property or the operation of emergency governmental functions. This includes but is not limited to ambulances, law enforcement vehicles, and fire trucks. Snow removal vehicles are not exempted (sand trucks); graders & front end loaders are mobile equipment so no CDL is required. (Does not include Forest Fire equipment.)
c) Farmers, vehicles controlled and operated by farmers used to transport farm machinery, farm supplies, or agricultural products to and from a farm. Not used in the operations of a common or contract carrier, and used within 150 miles of the farmer's farm straight line distance.
d) Recreation vehicles when used for recreational purposes.
e) Personal vehicles (U-Haul type trucks) used to transport personal property that is not for sale.
f) Commercial motor vehicle operators in the State of Alaska that meet BOTH of the following criteria are exempt from skill (road) test requirements and will be issued an off-system license. Off-system license: 1) roads not connected by land highway or vehicular way to the land-connected state highway system and 2) roads not connected to any highway or vehicular way with an average daily traffic volume greater than 499.

WHAT ARE THE CLASSES OF COMMERCIAL DRIVER LICENSES?

In order to comply with the licensing requirements of the Commercial Motor Vehicle Safety Act, the current classification system will change to:

CLASS A - combination vehicle with a gross vehicle weight rating of 26,001 pounds or more, provided the gross vehicle weight rating of the vehicle(s) being towed is in excess of 10,000 pounds. Holders of a class A/CDL may also operate a class B/CDL, C/CDL or D vehicle.

CLASS B - single vehicles with a gross vehicle weight rating of 26,001 pounds or more, or any such vehicle towing a vehicle not in excess of 10,000 pounds. Holders of a class B/CDL may also operate a class C/DCL or D vehicle.

CLASS C - Any single vehicle than 26,000 pounds GVWR, or any such vehicle towing a vehicle with a GVWR of 10,000 pounds or less. Any combination of vehicles where the towing vehicle is less than 26,000 pounds GVWR and the towed vehicle has a GVWR of 10,000 pounds or less, but together they are 26,000 pounds GVWR or more; or does not meet the definition of Class A/CDL or Class B/CDL and (a) is designed to transport 16 or more passengers including the driver; or (b) is used in the transportation of materials found by the United State Secretary of Transportation to be hazardous for the purposes of 49 CFR USC 1801-1813 and which required the motor vehicle to be placarded under the Federal Hazardous Materials Regulations. Holders of a Class C/CDL license may also operate a Class D vehicle.

WHEN ARE ENDORSEMENTS REQUIRED?

Drivers of certain vehicles also require endorsement in addition to the required class of license. Endorsements are:

T - Double or Triple Trailers
N - Any vehicle intended for hauling liquids or gaseous material in bulk
P - Any vehicle designed to transport 16 or more passengers including the driver
H - Any vehicle used to transport hazardous materials in placardable amounts
X - The combination of the N and the H endorsements.

WHAT TESTS DO I NEED TO TAKE?

You must pass the knowledge tests that are required for the class of license and endorsements you need. You may

also need to take a skills test, depending upon the type of vehicle you intend to drive and how long you have been driving that type of vehicle, your current class of license, and your driving record. (See Table 1.)

The state has special requirements for a school bus. Please contact the Division of Motor Vehicles.

GRANDFATHERING

An employee may be grandfathered if the employee and employer complete a CDL certification form. The employee must certify that during the two-year period immediately prior to the date of submission of the Grandfathering Certification that the employee:

1. Has not operated under the influence of alcohol or a controlled substance.
2. Has not left the scene of an accident.
3. Has not been convicted of a felony involving the use of any motor vehicle or involving the manufacturing, distributing, or dispensing of a controlled substance involving the use of any motor vehicle.
4. Has not violated any state or local law relating to motor vehicle traffic control arising in connection with any traffic accident.
5. Has not had their license revoked, suspended or cancelled.
6. Has not had an accident in which the applicant was at fault.
7. Have operated a vehicle representative of the class of vehicle for which they are applying for a license.

The applicant cannot have been convicted more than ONCE of the following Federal-defined "serious traffic violations" two years preceding application:

1. Excessive speeding (15 mph or more above posted speed).
2. Reckless driving (Alaska has mandatory revocation for conviction of reckless driving. If convicted within the preceding two years, applicant is not eligible for grandfathering).
3. Improper or erratic lane change.
4. Following the vehicle ahead too closely.

The employer must certify that the employee has operated a commercial vehicle for at least two years prior to applying for a CDL and that the employer has no knowledge of nor do the driver files maintained on this driver show any convictions for violations listed under Part 1 (The Employee Certification) of the Waiver of Skill Exam form or for any accident in which the driver was at fault.

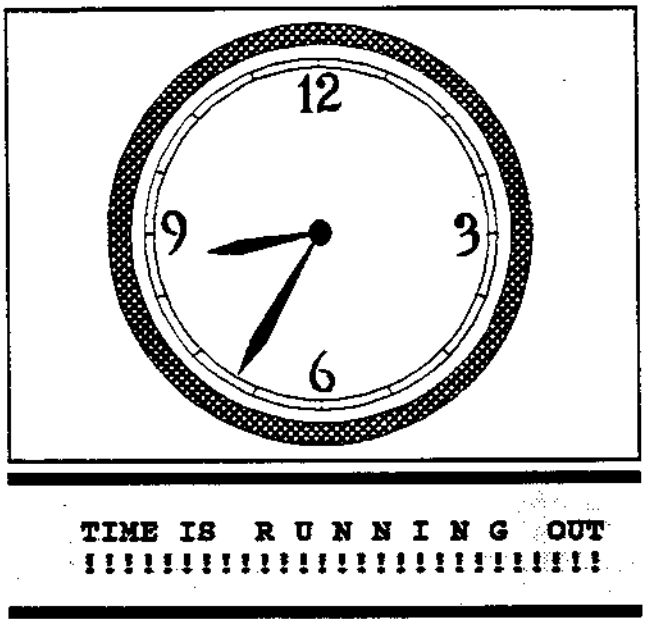
The applicat should not have more than one license or they will be required to surrender all licenses before the CDL will be submitted.

ALASKA TEST SITES

Any office of the Division of Motor Vehicles.

TABLE 1

License	Knowledge Test (written)	Skills Test
Class A	50 Questions, plus 20 questions combination test and 25 questions air brakes test	Yes - unless grandfathered
Class B	50 Questions	Yes - unless grandfathered
Class C	50 Questions	Yes - unless grandfathered
Passenger Endorsement	20 Questions	Yes, in a bus - unless grandfathered
Doubles/Triples Endorsement	20 Questions	No
Tank Vehicle Endorsement	20 Questions	No
Hazardous Material Endorsement	30 Questions	No
Air Brake Restriction Removal	25 Questions	Yes, in an air brake equipped vehicle



THIS IS NOT A TICKET (THIS TIME)

This time it's just a warning.

But after April 1, 1992, if you don't have a CDL, it will be a ticket.

The commercial driver's license law provides for fines up to $5,000 and prison terms of up to 90 days for driving without a CDL.

You don't want that, and we don't want that.

Why take chances?

Get your CDL now, before time gets short and the lines get long.

--Federal Highway Administration

IF YOU DRIVE ANY OF THE FOLLOWING, YOU WILL NEED THE CDL LICENSE BY APRIL 1, 1992

☑ Combinations of vehicles with a GCWR over 26,000 lbs.

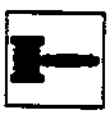
☑ Single vehicle with a GVWR over 26,000 lbs. (This does not include motor homes)

☑ Vehicles transporting 16 or more passengers including the driver.

☑ **ANY** vehicle carrying hazardous materials in amounts requiring it to be placarded.

If you are not sure if the type vehicle you drive will require a CDL, please call Div. of Motor Vehicles at 452-4585 or 452-1511. We'll be happy to answer your questions.

CALL 452-4585
FOR INFORMATION



After April 1, 1992, if you are stopped while driving a vehicle that requires a CDL, you can be fined up to **$5,000** and your **EMPLOYER** can be fined up to **$2,500.**

SECOND INTERAGENCY SYMPOSIUM ON THE STABILIZATION OF SOILS AND OTHER MATERIALS

Purpose: To provide a forum for engineers, scientists, and others to discuss the latest technology on the stabilization of soils and other materials, to identify research needs, and to identify problems of mutual interest to guide future research and development. This is a follow-up to the first symposium that was held in Denver, CO in November 1989.

When: November 3-5, 1992

Where: New Orleans, Louisiana, Landmark Hotel

Who: Attendance is open to all. However, all technical presentations will be by invited speakers.

Proceedings: Conference proceedings will be published.

Exhibits: An exhibit area for U.S. Government agencies will be provided to accommodate additional technical presentations.

Length: The symposium is scheduled to begin at 8:30 a.m. on Tuesday, November 3, and adjourn about 1:00 p.m. on Thursday, November 5, 1992.

Registration: A second brochure will be available in early spring that will provide additional information including lodging, registration forms, fee payment, instructions, and a detailed agenda. Registration fee will be $200.00.

Symposium Format

Eight technical sessions will be held as follows:

Pavements and Horizontal Construction

Covers use of chemical, machanical, and geosynthetic stabilization techniques in road and airfield pavements and in other horizontal structures, such as parking and storage areas.

Soil Stabilization with Contaminated Soil

Includes methods used to inhibit the migration of contaminants from soils to include contaminant specific formulations, mixed organic/inorganic contaminants, long-term physical and chemical durability, and prediction of binder performance based on soil and contaminant properties.

Dams and Water Conveyance Systems

Covers the use of current stabilization techniques and construction materials applicable for use with water retention structures and conveyance systems.

Waste/By-products Stabilization and Utilization

Covers the available technology and current R&D for the stabilization/utilization/disposal of the more ubiquitous and problematical wastes and by-products, such as municipal incinerator residue, waste tires, and lime and sulfate wastes. The impacts of state, federal, and local legislation and of institutional factors on the utilization, stabilization, and disposal of wastes and by-products will be discussed.

Geosynthetics/Soil Reinforcement Systems

Covers the use of geosynthetics and other materials to improve the performance properties of unstable and compacted materials.

Erosion Control

Includes dust and erosion control using combinations of vegetative, chemical, and geosynthetic methods, basic mechanisms of erosion, and field studies of cost and effectiveness.

In situ (Deep) Stabilization - Focuses on the existing and needed technology for improving deep soil deposits by densification, reinforcement, or modification to improve their strength. Such topics as vibroflotation and compaction, deep dynamic compaction, stone columns, compaction grouting, and chemical and slurry grouting will be discussed. Liquefaction technology will also be addressed.

Waste Management - Includes characterization of in situ conditions, monitoring for long-term performance and durability of materials, leachate collection systems, and laboratory testing of waste materials.

Sponsors

U.S. Army Corps of Engineers
Soil Conservation Service
Bureau of Reclamation
Environmental Protection Agency
Federal Highway Administration
Naval Facilities Engineering Command

For additional information including exhibit space Please contact:

Newell Brabston, COE, (601) 634-2116
Terri Casias, USBR, (303) 236-6090
Charlie McElroy, SCS, (817) 334-5444
Clay Ormsby, FHWA, (703) 285-2657
Trish Erickson, EPA, (513) 569-7884
Mike Jones, NAVFAC, (703) 325-0048

SOIL NAILING OF A BRIDGE FILL EMBANKMENT

Soil nailing, as an alternate lateral earth support system, has been used extensively in Europe to stabilize highway slopes and to support temporary and permanent vertical soil cuts. In the United States, this system has also been successfully used for the same functions. In 1985, the first highway soil-nailed wall was used to temporarily support cuts up to 40 feet on the Federal Highway Administration's (FHWA) Cumberland Gap Tunnel project in Kentucky.

A recent construction project involved widening and lowering the grade of the Swift Highway under the south end of the Oregon Slough Bridge approximately seven miles north of Portland. This project included construction of the first permanent soil nailed wall on the state highway system.

This soil nailing (embankment support) construction consisted of placing passive (unstressed) steel bars in the in-situ soil to improve the shear strength of the reinforced soil by limiting decompression and dilation immediately after excavation. The reinforced soil body, given improved strength characteristics, became the prime structural element. The reinforced zone performs as a homogenous and resistant unit to support the unreinforced soil behind it, in a manner similar to a gravity wall. The excavation was staged and was from the "top down." The soil nails (steel bars) were instralled in a lift-by-lift sequence as the excavation progressed. Nail spacing was designed so the material between the nails would arch and form a reinforced earth block. The outside facing of the structure, which prevents relaxation or sloughing of the ground, consists of a thin layer of shotcrete with wire mesh reinforcing.

The construction of this project shows that soil nailing is a viable lateral earth support system to retain the existing Oregon Slough Bridge fill embankment and roadway widening without disrupting bridge traffic. The soil nailing technique offered the following advantages over other types of walls:

1) Soil nailing is better suited than Tiedback walls for roadway widening under an existing bridge. Soil nailing required no soldier pile installation; therefore, holes did not have to be cut through the existing bridge deck.

2) Soil nailing is easier to construct and reduces the construction time. No soldier pile installation was required, and construction equipment was small scale and mobile, allowing the contractor to work in low overhead clearance conditions.

3) Soil nailing is a flexible form of construction. The sequence of construction was altered, and the modification easily adapted during construction to fit the soil site conditions.

Recently, the results of this study were published in a construction report titled "Soil Nailing of a Bridge Fill Embankment." To obtain a copy of this report or any additional information on this topic, please contact:

Claude Sakr
Bridge Section
Oregon State Highway Division
Transportation Building, Room 329
Salem, OR 97310
(503) 378-6551

Reprinted from "Research Notes", Highway Division Materials & Research Section, November 1991, RSN 91-8.

Grooved Windshields Improve Visibility for Snow Vehicles

A simple glass-etching process imported from Finland could make streaked windshields and ice-clogged wipers just a snowplow operator's memory.

"Tu-Grooves" is a patented technique used to cut two thin, parallel grooves in a windshield to keep wiper blades free of snow and ice and also remove dirt to reduce streaking. The process, says Dave Bell, whose Lansing, MI-based company holds exclusive U.S. marketing rights on it, takes only five to 10 minutes to perform.

"The grooves are placed in the windshield parallel to your wiper blades and they run just above the lowest spot of the swoop of your wiper blades," he explains. "Each time the blades cross the grooves, the grooves remove the dirt, salt, oil, ice and snow from the edge of your wiper blades."

Bell says the grooving process starts with a suction cup being placed on the windshield as a guide. It measures a specific distance and an air-driven, water cooled machine is run across that guide and cuts the groove in the glass.

Extensive testing has shown that the process does not weaken the glass. Bell claims: "It's more of an etching. You're not cutting or scoring the glass." The grooves in the windshield are only .004 - .12 inch deep, he notes— less than one-third the thickness of a dime.

Bell's company has grooved between 6,000 and 8,000 windshields, mostly fleet vehicles in Michigan. Nine vehicles, including plows, a blower, and other snow removal eqipment, were grooved at Lansing Capital City Airport in 1985. Douglas Campbell, field foreman at Lansing, says it improved their snow operations there.

"It helps eliminate the ice from the windshield," he relates. "Not only the ice, but the residue from the urea— there's no streaking." And, says Campbell, "I seem to be getting longer wear out of the wipers."

The first Tu-Grooves franchise opened recently in Fairfax County, VA. Tu-Grooves eventually will expand nationally through existing glass installation businesses. The process costs $30 per car and "40 per truck and fleet rates are avaialble. Bell says until the franchise grows the company will perform out-of-state fleet jobs it they're large enough. — K.B.

Reprinted from, Airport Services Management, October 1987, with permission from Airport Services.

American Concrete Institute Training:

Hot & Cold Weather Concreting: **Fees:** $225 members
Montreal, Quebec - 3/4/92 $245 nonmembers
Salt Lake City, Utah - 4/8/92
Albuquerque, New Mexico - 4/9/92

Designing Earthquake-Resistant Concrete Structures:
San Francisco, California - 3/11/92
Porland, Oregon - TBA
Kansas City, Missouri - 4/15/92
Nashville, Tennesse - 4/16/92

Trouble Shooting Concrete Construction Seminars:
Washington D.C. - 3/14/92
Roschester, New York - 4/21/92

For information contact: T2 Office at (907) 474-2484.